

# CONSTRUCTION, SANITATION, AND HYGIENE

IN CHARGE OF  
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## PRACTICAL SUGGESTIONS FOR A MODERN HOSPITAL LAUNDRY, AND MODERN METHODS OF WASHING HOSPITAL CLOTHES; WITH SOME COMPARISONS AS TO COST OF LAUNDRY WORK IN EIGHT GENERAL HOSPITALS

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DR. ABBOTT's articles in *THE AMERICAN JOURNAL OF NURSING* must be very helpful to those interested in hospital management. It may be interesting to superintendents and matrons to supplement Dr. Abbott's work by further suggestions, particularly as to every-day modern laundry methods.

The Boston City Hospital recently constructed a new laundry, having outgrown its old one. Nearly all of its machinery was the old patterns, inefficient and unprofitable. The new laundry was completed a year ago and new machinery installed at a cost of about twenty thousand dollars, including all machinery, drying-rooms, hot- and cold-water supply, drains, and other furnishings. The laundry does the work for a hospital of five hundred and twenty-eight patients and a family of three hundred and fifty-eight officers and employees, making a total of eight hundred and eighty-six persons. The ward linen is often laundered three, four, and even five times a week, and the pieces rarely number less than seventy-five thousand per week.

The location of the laundry, relative to the hospital buildings, is good, it being the most remote building from the wards. Unfortunately, it is built on a restricted site, forcing us to have four stories, but ready access is given by broad and easily ascending stairs and a capacious elevator for both freight and employees. The building is ninety feet long by thirty-eight feet wide, with a two-storied ell forty-two feet wide by sixty feet long. The lower floor is used as a hospital wash-room, with an extra large steam mangle for flat work. The second story sup-

plements the lower floor in ward linen, and contains receiving-, distributing-, drying-, and airing-rooms, the larger portion being given to mangle and machine work. The third floor is used for family laundry work, contains a receiving-, distributing-, drying-, and wash-rooms, and also a room for laundry machines for ironing. The fourth floor has chambers for women employed in the laundry.

The hospital wash-room on the lower floor is constructed of glazed brick walls, granolithic floor, and contains the following machinery:

One Empire sterilizing boiler-iron washer, two-hundred-and-fifty-shirt capacity.

Two two-hundred-shirt capacity metallic rotary washers.

Two one-hundred-and-fifty-shirt capacity wooden washers: Total capacity nine hundred and fifty shirts.

Three extractors.

One shaker-out.

One Hagen six-roll mangle, capable of doing fifteen thousand pieces of flat work per day of ten hours.

Five porcelain wash-tubs.

The second floor is called the hospital ironing-room, the walls being smooth brick, painted with white enamel paint, and the floor is of hard pine. This room is equipped with the following machinery:

One Crawford Jumbo mangle.

Four body-ironers.

Two yoke-ironers.

The third floor, or the family laundry, has a wash-room eighteen feet wide by twenty-four feet long, the construction being the same as the lower floor, with enamelled brick walls and granolithic floor, and is water-proof to protect the floors below. The machinery upon this floor, which includes both the family wash-room and ironing-room, is as follows:

One wooden rotary washer of two-hundred-shirt capacity.

One wooden rotary washer of one-hundred-and-fifty-shirt capacity.

One extractor.

Four porcelain set tubs.

One starch-cooker.

One starching-machine.

One shaker-out.

One Hagen six-roll mangle.

Four body-ironers.

Two yoke-ironers.

One cuff- and collar-machine.

One Asher collar-shaper.

One collar-seam dampener.

One hydraulic dampening press.

Two Tyler shirt-machines.

The Empire sterilizing boiler-iron washer was first made at my suggestion, and is an iron rotary machine-washer and sterilizer. As everyone familiar with hospital work well knows, one of the great annoyances in sterilizing clothing is that it is first sterilized to free from infection and then washed afterwards. Sterilizing by steam under pressure acts as a mordant, and sets the stains, so that they can neither be properly washed nor made white except by subjecting them to strong bleaching, which is apt to impair the fabrics. The scheme of the combined sterilizer and washer is that infected clothes may be put in this washer and first washed in boiling water, according to the methods as described in this paper later on, and after washing the door is clamped down, and steam under fifteen pounds pressure, giving a temperature of 250° F., thoroughly sterilizes the clothing, which then may be treated as ordinary laundry goods in the same washer without removing. In my judgment, washing clothing in a machine that has been subjected to boiling is a safe method for ordinary disinfection, but the combined sterilizer and rotary washer should be used for the infected clothing of a more dangerous nature. The two metallic rotary washers and the two wooden washers of the ordinary type need no further description. The clothes are wrung by three extractors such as are now in general use. When the clothes, however, are taken out of these extractors they are thoroughly bedded together, like hard-packed figs in a box. The "shaker-out" is the shell of a rotary washer, and the clothes, taken from the extractor and put in the "shaker-out," speedily unfold under the reversing motion and are practically ready for the mangle. A large-sized "shaker-out" does as much work as five laundry employees can do by hand.

The Hagen six-roll mangle is a machine of large capacity, capable of ironing at least fifteen thousand pieces of flat work per day of ten hours' work. There are a few other machines in the market probably as efficient as this six-roll mangle, but this mangle was decided upon on account of its efficiency, simplicity of construction, and because it brings the clothes out perfectly dry. This mangle requires seven women to feed, receive, and fold the clothes properly.

On the second story, or hospital ironing-floor, the Crawford Jumbo mangle, which is one of the old machines repaired from former use, is used, principally for the smoothing out of ward shirts, bed-gowns, and stockings, and does the most crude mangling in the building.

On the third floor, the rotary washers and extractors in the family

wash-room are similar to those on the lower floor. They have a capacity of three hundred and fifty shirts, which, combined with the washers on the lower floor, makes a total capacity in the whole laundry of thirteen hundred shirts. On this floor is a duplicate of the six-roll mangle on the lower floor. This was purchased in order to have high-grade machines of very large capacity always available, so that if one broke down or was out of service from any cause, there would be a second for immediate use. The body- and yoke-ironers, of which there are twelve on the two floors, certainly are the most valuable and useful modern machines for laundry work. One body-ironer, by actual test, will do as much work as five women can do by hand. This machine is serviceable for a large variety of work. Men's shirts of all kinds, including officers' and employees', duck coats, trousers, and operating-gowns, women's dresses, aprons, skirts, and underwear, are ironed on these machines without using the hand-iron. They not only do the work more expeditiously, but, for general purposes, quite as well as hand work. For institution work these machines, of which there are several varieties, are invaluable. The cuff- and collar-machine, collar-shaper, seam-dampener, and Tyler shirt-machines are too well known to need further description, and are important in labor-saving as well as improving the quality of the work.

Nothing is more annoying to a hospital superintendent or matron than to see clothes, not only of officers and employees, but ward linen, poorly done, sometimes brown in color, as if not properly rinsed, smelling disagreeably, and full of creases—in short, bad laundry work. No nurse can make her ward presentable with faulty ward linen of this sort. Many institution laundries are run without judgment or correct knowledge of the proper methods of washing and ironing, particularly the washing. Oftentimes the clothes are tumbled into the washer, soft soap is poured in "by guess," and the machine is allowed to run without care or system, which inevitably results in bringing out clothes imperfectly washed.

To make some practical, every-day suggestions the following is submitted:

*Rules and Formulae for Washing in Rotary-Machine Washer.*—To wash one hundred and fifty shirts, fill the rotary washer with cold water so it will show in bottom of glass gauge; rinse five minutes. For badly soiled clothes, rinse twice with cold water. Then use warm soapsuds. For ordinary soiled clothes, one gallon of solution of soap, but for very dirty clothes two gallons, and run ten minutes extra. This is "first suds." Use less water in washing than in rinsing. Put in the solution of soap and the "bleach" in the second suds; bring this to a boil. Run fifteen minutes; then empty, and give three rinses, five minutes each, of

the hot and cold water running together. Then use oxalic-acid solution with hot water for "sour." Bring water to a boil, five minutes; run off; then let in cold water for bluing, five minutes. The clothing is now finished and ready to take out. Total time for one load, one hour and ten or fifteen minutes. In washing family clothes there is usually a hot-water rinse between the "sour" and the "blue." In case the clothes get too blue, run bluing water off and run in hot water, one minute.

*For the Solution of Oxalic Acid ("Sour").*—Put two ounces of commercial oxalic acid, ninety-eight per cent., into one gallon of boiling water, thoroughly dissolve, pour into a one-hundred-and-fifty-shirt machine, holding sixty to seventy gallons of water. This "sour" is to take out all kinds of stains and to clear the clothes; it also assists much in holding the aniline bluing.

*For the Solution of Lime and Soda ("Bleach").*—Dissolve thirty pounds of ninety-eight per cent. commercial chloride of lime and twenty pounds of ninety-eight per cent. caustic soda in sixty gallons of water. Put the dry chloride of lime, thirty pounds, in the stone-ware tank of sixty-gallon capacity first, then run the tank half filled with cold water—not warm. This should stand over night and the scum be removed in the morning. Then take the caustic soda, twenty pounds, in a pail, pour boiling water on it, dissolve, and pour into the lime solution. Then fill the tank with hot or boiling water, stir thoroughly; then let it stand until the next morning and skim it again. It is then ready for use. Put half a pint of this solution of lime and soda in a one-hundred-and-fifty-shirt washer, sixty to seventy gallons of water.

*Bluing* should be made of one ounce of aniline blue to a gallon of warm water. Aniline bluing for laundry work is made in large varieties of shades and value. Care must be taken in its selection. One ounce of this solution is used in the one-hundred-and-fifty-shirt washer, diluting it in a pail of water, distributing it gradually through the water while the washer is in motion.

*Laundry Solution of Soap.*—To one hundred gallons of water add fifty pounds of soap-chips and five pounds of caustic soda. When a one-hundred-gallon galvanized iron tank is half filled with water, pour in fifty pounds of soap-chips and boil by means of a steam coil. After the fifty pounds of soap-chips are thoroughly dissolved and the five pounds of ninety-eight per cent. caustic soda dissolved in a pail of water, put them in the tank and fill it up. If soap or soap-chips require more than fifty pounds to five pounds of soda and one hundred gallons of water to make a good solution of soap they are below the proper standard.

*Soaps for Washing Hospital Blankets and Woollen Clothes of all Kinds.*—To olive-oil soap-chips, ten pounds to ten gallons of water, add five pounds of commercial borax powder. Dissolve the olive-oil soap-chips in a tank half filled with water. This may be made in an ordinary porcelain or soapstone-set tub with a steam coil. When the tub is half filled with water dissolve the soap, and when ready dissolve also the borax powder in a pail of water, and mix with the olive-oil soap-chips and boil. Take ten ward single blankets, or their equivalent in body clothing, put in the rotary washer, add two quarts of olive-oil soap solution, and wash from five to eight minutes. For a second washing use only one quart.

One of the "secrets" of washing woollen blankets and clothing so they will not shrink is in being careful about the temperature of the water. Get the water as nearly as possible to 105° F. If the blankets need a second washing, take a second tub, taking the clothes out of the first tub and putting them in the second. If this is done, it will bring the clothes through the wash without shrinking. Clothes and blankets of wool will not shrink if kept in water of strictly the same temperature. Shrinking results from subjecting wool to hot and then cooler water, or *vice versa*.

*Laundry Starch.*—Use solution of corn-starch for dresses, skirts, coats, trousers, etc., and wheat-starch mixture for shirt-bosoms, collars, and cuffs. To one pound of corn-starch add one gallon of water; boil twenty minutes. To a one-hundred-shirt washer, three pails of solution starch need two pails of hot water.

*Wheat-Starch Mixture.*—For three-quarters of a pound of wheat-starch and a quarter of a pound of corn-starch allow a gallon of water. Boil twenty to twenty-five minutes. Strain and put into a machine starcher containing clothes.

The soaps and all laundry chemicals are made by exact scale liquid measurement every time, and are never guesswork. Employees of sufficient intelligence and faithfulness must be found, regardless of wages. Otherwise any method will be useless.

I am much indebted to our head laundress, Mrs. Harvey, for working out the formulæ and methods advocated in this paper. The foregoing regulations and formulæ are used at this hospital and have produced uniform good results. Much time was given on opening our new laundry in working out the best ways and means to produce these results. When once established a faithful and trusty head laundress will keep to the standard. Generally a woman is in charge of institution laundries. She should not be employed because she "goes to our church" or "has seen better days," but because she thoroughly knows her business.

COMPARISONS OF LAUNDRY STATISTICS OF EIGHT GENERAL HOSPITALS.

To designate the Hospital.....	A.	B.	C.	D.	E.	F.	G.	H.	I.
Persons employed, etc.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.	Wages per No. month.
Head laundress.....	1 at \$30	1 at \$30	1 at \$35	1 at \$20	1 at \$16	.....	1 at \$30	1 at \$25	1 at \$40
Laundry men.....	1 at \$35	1 at \$30	.....	.....	1 at \$30	* 1 at \$65	1 at \$45	1 at \$50	2 at \$30
Laundry men.....	1 at \$25	1 at \$25	.....	.....	.....	* 1 at \$30	.....	1 at \$25	1 at \$20
Laundry men.....	.....	.....	.....	.....	.....	1 at \$25	.....	.....	.....
Laundry women.....	1 at \$16	1 at \$16	1 at \$25	1 at \$13	.....	* 1 at \$26	1 at \$18	2 at \$15	1 at \$17
Laundry women.....	3 at \$15	3 at \$15	2 at \$20	5 at \$12	2 at \$14	2 at \$18	2 at \$16	11 at \$14	5 at \$15
Laundry women.....	3 at \$13	3 at \$14	3 at \$16	.....	2 at \$13	4 at \$16	1 at \$15	.....	10 at \$14
Laundry women.....	4 at \$13	10 at \$13	2 at \$15	.....	3 at \$12	3 at \$13	10 at \$14	.....	5 at \$13
Laundry women.....	.....	7 at \$12	3 at \$14	.....	.....	.....	.....	.....	.....
Laundry women.....	.....	1 at \$10	.....	.....	.....	.....	.....	.....	.....
Total men per month.....	1 at \$35	2 at \$55	.....	.....	1 at \$30	3 at \$120	1 at \$45	2 at \$75	3 at \$80
Total women per month.....	9 at \$143	26 at \$357	12 at \$220	7 at \$93	8 at \$106	10 at \$165	15 at \$235	14 at \$209	22 at \$337
Total workers per month.....	10 at \$178	28 at \$412	12 at \$220	7 at \$93	9 at \$136	13 at \$285	16 at \$280	16 at \$284	25 at \$417
Average number patients.....	281	266	125	89	103	188	189	197	403
Average number officers and employees.....	113	245	129	70	107	160	183	198	358
Total persons.....	394	511	254	159	210	348	372	395	761
Total wages for all laundry employees for one year.....	\$2,136	\$4,944	\$2,640	\$1,116	\$1,632	\$3,420	\$3,360	\$3,408	\$5,004
Yearly cost of living at (say) \$3.50 per week.....	\$1,820	\$5,096	\$2,184	\$1,274	\$1,638	\$1,638	\$2,912	\$2,912	\$4,550
Total cost wages and board per year.....	\$3,956	\$10,040	\$4,824	\$2,390	\$3,270	\$5,058	\$6,272	\$6,320	\$9,554
Number pieces washed—week.....	13,403	25,431	12,315	6,355	9,874	15,000	25,000	20,529	75,869
Number pieces washed—year.....	696,956	1,322,412	640,380	330,460	513,448	780,000	1,300,000	1,067,508	3,945,188
Cost per one hundred pieces.....	56.7c.	75.9c.	75.3c.	72.3c.	63.6c.	64.8c.	48.2c.	59.2c.	24.2c.

\* Lives at home.

† Live at home.

After our new laundry had been running a year, equipped as described above, I determined to know if this hospital had made a good investment in spending so much money for laundry machinery. I obtained the statistics submitted in the table on page 662 from eight large and well-known general hospitals in cities. It would have been obviously unfair to include in this list insane hospitals, where much of the labor is not paid. The Boston City Hospital is designated by the letter I; the names of the other hospitals are designated by letters only for obvious reasons.

The foregoing table requires more than a casual study to fully appreciate the value of the facts in connection with laundry work. At first one is impressed at the wide difference of wages paid, as well as ratio of employees to pieces treated, which seem to be governed by local conditions and, probably, traditions. There is a wide difference in the cost of washing one hundred pieces, varying from 24.2 cents to 75.9 cents. From a personal knowledge of all the hospitals given in the foregoing schedule, the writer feels sure that it is not always the hospital that expends the most money per hundred pieces that is necessarily badly managed.

For instance, comparing the work done by Hospitals B and I: Hospital B launders work for 511 persons, Hospital I, 761 persons; Hospital B expends \$4,944, against \$5,004 for Hospital I. Wages paid by Hospital B for doing laundry work for 511 persons is \$10,040, including both wages and living; Hospital I spends \$9,554 for doing laundry work for 761 persons. Hospital B washes 25,431 pieces at an average cost of 75.9 cents per hundred; Hospital I washes 75,869 at a cost of 24.2 cents; or, otherwise stated, Hospital I washes three times as many clothes as Hospital B for one-third the cost and for a much larger number of persons. This fact is easily explained. Hospital B has not modern machinery and very much of its laundry work is done by hand. Hospital I has machinery equipment of the latest type and does its work as well if not better than Hospital B. Other comparisons can be easily made from the statistical table offered here.

This comparative study aims to show three things: first, the up-to-date equipment of a large hospital laundry; second, methods of laundry work to bring good results; and, third, to demonstrate that, like machine-shops, factories, or other industrials, it is necessary to equip laundries with the latest and most improved machinery in order to produce the finest results with greatly reduced cost.